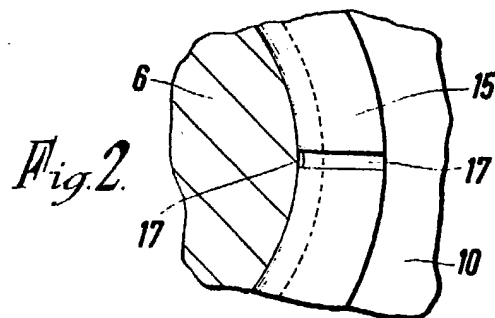
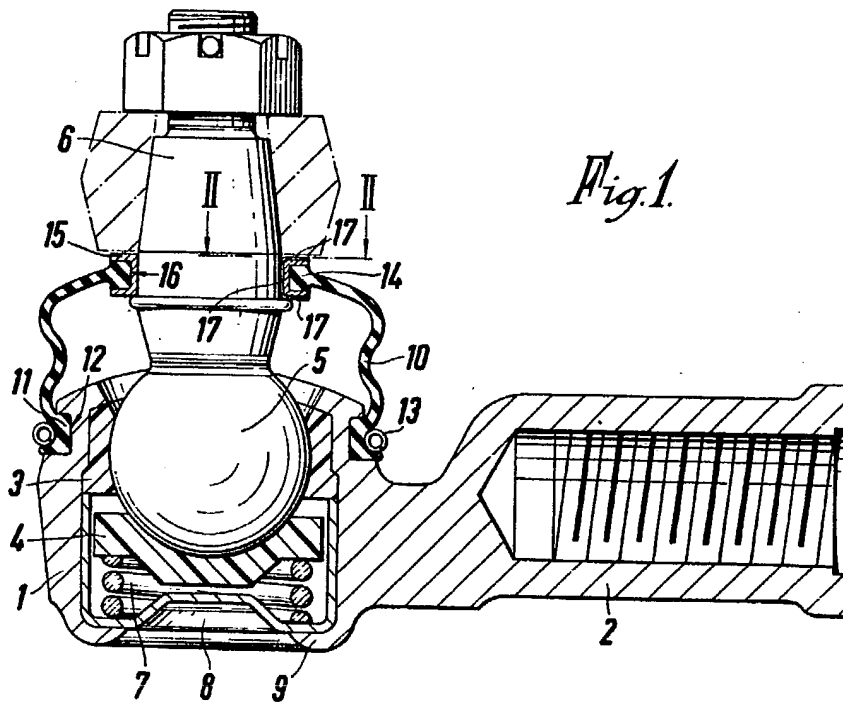


1,000,622  
1 SHEET

COMPLETE SPECIFICATION

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# PATENT SPECIFICATION

1,000,622

1,000,622



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## COMPLETE SPECIFICATION

### DRAWINGS ATTACHED

#### Improvements in and relating to Ball Joint Assemblies

We, AUTOMOTIVE PRODUCTS COMPANY LIMITED, a British Company, of Tachbrook Road, Leamington Spa, Warwickshire, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed to be particularly described in and by the following statement:—

This invention relates to joint assemblies of the ball and socket type as used for example in the steering linkage of road vehicles and in which a flexible boot is provided to prevent the ingress of dirt and moisture to the interior of the joint to protect the bearing surfaces of the ball and socket of the joint.

With the existing constructions of flexible boot difficulty is experienced in obtaining a satisfactory seal between the pin of the joint and the boot aperture through which the pin projects as the interference fit between the pin and the aperture in the boot must be such that not only is an efficient seal obtained but the boot must be capable of "breathing" to compensate for changes in the volume of air within the interior of the boot as the same is deformed during angular movement of the ball pin. It has been found however that if the interference fit is sufficient to meet these requirements the efficient working life of the boot is limited as the material from which the boots are constructed, usually natural or synthetic rubber, "ages" and with "ageing" tends to lose the elasticity of the material which maintains the boot in contact with the ball pin the resulting permanent set causing the boot aperture to "gape" around the pin so that the sealing effect is destroyed.

In order to overcome this disadvantage, in accordance with the invention it is proposed to provide a ring of for example a

synthetic plastic material having for preference self-lubricating properties, which can be interposed between the boot and the ball pin the bore of the ring being a close fit on the ball pin and having a passage or passages arranged to permit the boot to "breathe", the external periphery of the ring having an annular groove to receive a beaded edge of the aperture in the boot. It will be appreciated that the cross-sectional area of the passage or each passage is such that air only is permitted to pass therethrough the transference of any moisture or dirt therethrough being prevented. The ring can be made of any suitable material. Preferably however a synthetic plastic material is used, for example a fluorocarbon such as polytetrafluoroethylene, nylon or polyethylene.

An embodiment of the invention will now be described by way of example with reference to the accompanying drawings in which Figure 1 shows in section a ball and socket joint for the tie rod of a vehicle steering linkage, the joint assembly incorporating a boot modified in accordance with the invention, and Figure 2 is a fragmentary sectional plan view.

Referring to the drawings the ball and socket joint shown is generally of known construction and comprises a socket having a radially extending tubular arm which is threaded internally to receive the corresponding threaded end of a tie rod (not shown). The bore of the socket contains upper and lower bearing bushes and 4 respectively which engage the ball end 5 of the ball pin 6 the lower bearing bush 4 being spring loaded by a coil spring 7 acting between the bush and a closure cap 8 which is retained in position by the deformed lip edge 9 of the socket.

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The flexible boot is also generally of conventional form and consists of an annular casing 10 which is made as a moulding in natural or synthetic rubber or other elastomeric material. The casing 10 is open at its opposite ends, the aperture of larger diameter at one end having an internally beaded rim 11 which engages in an external annular groove 12 in the socket. A garter spring 13 is provided to assist in retaining the beaded rim in the groove. The aperture of smaller diameter through which the shank of the ball pin extends has a beaded rim 14 the ring 15 of for example synthetic plastics material having for preference self lubricating properties being interposed between the beaded rim 14 of the boot and the ball pin shank, the bore of the ring being a close fit on the ball pin and having a passage or passages as hereinafter described arranged to permit the boot to "breathe", the exterior of the ring having an annular groove 16 to receive the beaded rim 14 of the boot.

The ring 15 which can be made as a moulding in a synthetic plastics material, is of channel section with the open side of the channel extending around the outer periphery of the ring to provide the groove 16 receiving the beaded rim 14 of the boot. At least one passage 17 is provided in the ring the passage extending continuously in the radial direction across the outer surfaces of both sides of the ring the said radial portions being joined by a portion extending along the bore of the ring. In the assembled ball joint, the ring 15 extends around the ball pin, the bore of the ring being a close fit on the pin, the beaded rim 14 of the aperture in the boot being disposed in the channel groove 16 in the ring exterior. As the bore of the ring 15 is a close fit around the ball pin, in use the ring will tend to turn with the pin relative to the boot. This has the advantage that wear of the boot aperture is considerably reduced if not entirely eliminated particularly if the ring is formed from a synthetic plastics material having self-lubricating properties. In addition as the periphery of the boot aperture is trapped in the channel or annular groove 16 in the ring periphery the tendency to "gape" is also considerably reduced. Any desired number of passages 17 can be provided in the ring the passages being angularly spaced from one another around the ring.

It will be appreciated that the cross-sectional area of the passage or each passage 17 is such that air only is permitted to pass therethrough the transference of any moisture or dirt therethrough being

prevented. The ring 15 can be made of any suitable material. Preferably however a synthetic plastics material is used, for example a fluoro-carbon such as polytetrafluoroethylene, nylon or polyethylene.

#### WHAT WE CLAIM IS:—

1. A flexible sealing boot for ball and socket joint assemblies comprising an annular casing of natural or synthetic rubber or other elastomeric material, said casing being open at its opposite ends, the aperture at one end of the boot being adapted to embrace the socket and the aperture at the other end being adapted to surround the shank of the ball pin, the latter aperture being fitted with a ring the bore of which is a close fit on the ball pin shank said ring having a passage or passages arranged to permit the boot to "breathe".
2. A flexible sealing boot according to claim 1 wherein the external periphery of the ring has an annular groove to receive a beaded rim of the boot aperture.
3. A flexible sealing boot according to claim 2 wherein the ring is of channel section the open side of the channel extending around the outer periphery of the ring.
4. A flexible sealing boot according to any one of the preceding claims wherein the passages or each passage extend continuously radially across the radial outer surfaces of the ring the said radial portions being joined by a portion extending along the bore of the ring.
5. A flexible sealing boot according to any one of the preceding claims wherein the ring is made from a synthetic plastics material.
6. A flexible sealing boot according to claim 5 wherein the synthetic plastics material has self-lubricating properties.
7. A flexible sealing boot according to claim 6 wherein the ring is made from a fluorocarbon e.g. polytetrafluoroethylene, nylon or polyethylene.
8. A flexible sealing boot as herein described with reference to and as shown in the accompanying drawings.
9. A ball joint assembly incorporating a flexible sealing boot as claimed in any one of the preceding claims.
10. A ball and socket joint as herein described with reference to and as shown in the accompanying drawings.

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